BARRICK

BARRICK RESOURCES (USA), INC.

March 25, 1992

Mr. Don A. Ostler, P.E. Director Division of Water Quality Utah Department of Environmental Quality Salt Lake City, Utah 84114-4870

Dear Mr. Ostler:

Subject: Docket No. GW92-02, Notice of Violation and Order

Barrick Resources (USA), Inc. ("Barrick") received on February 28, 1992 the above referenced notice of violation and order. In response to paragraphs 5 and 6 of the order, please find attached the document entitled "Study Plan to Characterize the Extent of Contamination, Barrick Resources (USA), Inc., Mercur Gold Mine, March 1992." The plan and appendices were prepared in accordance with the provisions of "The Code" 19-5-114.

Please contact me should you have any questions concerning the information contained in this submittal. The information contained in this letter or the attached report shall not be deemed to be an admission of liability by Barrick.

Sincerely,

Frank D. Wicks

Frank D. Wicks

Vice President and General Manager

FDW/cq

Enclosure

cc: Ken Alkema (DEQ)

Doug Crudell (Assist. Attorney General)

Ken Bousfield (UDDW)

Wayne Hedberg (DOGM)

Glade Shelley (Utah County)

Myron Bateman (Tooele County)

Lucy Jenkins (Parsons Behle and Latimer)

Lori Robison (Dames & Moore)

STUDY PLAN TO DETERMINE THE EXTENT OF CONTAMINATION

BARRICK RESOURCES (USA), INC., MERCUR GOLD MINE March 30, 1992

STUDY COMPONENTS

Surface Water Runoff Samples

A minimum of six (6) surface water runoff samples per location will be obtained and analyzed for total water chemistry in quality assurance/quality control Division accordance with Barrick will analyze for the appropriate parameters procedures. listed in Exhibit "A." Samples will be obtained at appropriate locations along the determined release flow path. Samples will also be obtained at appropriate locations in the natural drainage below the determined extent of the release flow path for the purpose of confirming the extent of any residual down gradient contamination. A map depicting the flow path and sample locations is attached as Exhibit "B". Samples will be obtained by Mercur personnel during periods of snowpack melt/runoff and rainfall runoff during April through September of 1992. of the sampling will be reported to the Division within thirty (30) days of receipt at the Mercur Mine.

Soil Samples

Soil samples will be obtained and analyzed for appropriate parameters utilizing accepted sampling and analytical procedures. Parameters to be analyzed include:

pH
Total chloride
Total cyanide
Total sulfate
Total nitrogen
Total phosphorous

A minimum of three (3) samples per location will be obtained at appropriate locations along the release flow path, primarily at the two (2) locations of primary sediment transport deposition (see Exhibit "B"). Samples will be obtained by Mercur personnel at such time and intervals as access to the area permits. Sampling will be conducted during the April/May 1992 time period, with additional samples possible during the monitoring of any ongoing revegetative effort. Results of the sampling will be submitted to the Division within thirty (30) days of receipt at the Mercur Mine. Soils determined to be unsuitable to support revegetation or native plant succession will be removed and placed into the tailings impoundment and replaced with topsoil from Mercur stockpiles.

Barrick Resources (USA), Inc., Mercur Gold Mine March 30, 1992 Study Plan to Determine the Extent of Contamination Page 2

EROSION CONTROL AND REVEGETATION MEASURES

Erosion Control

Erosion control measures have been initiated at locations currently accessible. Additional erosion control measures will be implemented as access to the release flow path areas becomes available to vehicles. Measures to be taken as appropriate include straw bales or drainage reconstruction and stabilization. It is anticipated that due to the minimal nature of erosion damage along the release flow path, any erosion control work required will be completed by June 1992, well in advance of the later summer, high intensity storm period.

Revegetation

Revegetation of those areas requiring such effort will be performed by Mercur personnel utilizing the appropriate level of equipment and/or manpower support. It is currently anticipated that the primary areas for revegetative effort will be the sediment transport outwash deposition areas. Species utilized for revegetation will be selected from those species currently approved for Mercur site reclamation and tailored for compatibility with the anticipated land use of the area. Revegetation work will be initiated upon the completion of all soil sampling and erosion control efforts. Most likely, revegetation will be performed in the September/October time period.

COMPLIANCE SCHEDULE

In summary, the compliance schedule is as follows:

- Surface runoff sampling completed by September 1992
- . Soil sampling completed by May 1992
- . Well/spring sampling ongoing per requirements under the tailings impoundment groundwater discharge permit process
- Erosion control implementation completed by June
- Revegetation implementation completed by October 1992

Barrick Resources (USA), Inc., Mercur Gold Mine March 30, 1992 Study Plan to Determine the Extent of Contamination Page 3

REMEDIAL EFFORT IMPLEMENTATION

Barrick initiated the following remedial actions immediately after the release event:

- . Removal or capping of piping at the saddle dam
- . Dewatering of the water reclaim cell and collection
- . Surface water runoff sampling
- Revised road maintenance procedures to accommodate quick access via all access routes to the tailings improvement area

In addition to these immediate actions and the study program and erosion control and revegetation measures described above, Barrick plans to take the following remedial and corrective actions:

- . An engineered pumping station will installed in the inactive water reclaim cell by June 1992
- Stricter operational procedures and schedules will be incorporated into the Mill Department operating procedures, such as routine operator inspections
- Reconfiguration and installation of improved surface runoff controls below the saddle dam area

No additional remedial or corrective actions are currently anticipated due to the minimal surface disturbance involved, the characteristics and quantity of released solution and the minimal potential impact on groundwater quality.

GROUNDWATER MONITORING IMPACT ASSESSMENT

Attached as Exhibit "C" to this report is a report prepared by Dames and Moore assessing the potential impact of the released solution to groundwater monitoring wells in the area.

LONG-TERM WATER QUALITY MONITORING

As described above, sampling of area surface runoff water is anticipated to continue through September 1992. Sampling of area wells or springs will continue as directed by the Division in connection with the groundwater permit process for the tailings impoundment. Monitoring of the water at the point of diversion for the surface water right located in Mannings Canyon and approximately .5 miles downgradient from the tailings impoundment

Barrick Resources (USA), Inc., Mercur Gold Mine March 30, 1992 Study Plan to Determine the Extent of Contamination Page 4

will be conducted semiannually. (This water right was identified in the material release report submitted by Barrick to the Division on March 13, 1992.)

Reports of monitoring results will be submitted to the Division within thirty (30) days of receipt at the Mercur Mine.

LBJ/032792A

PARAMETER

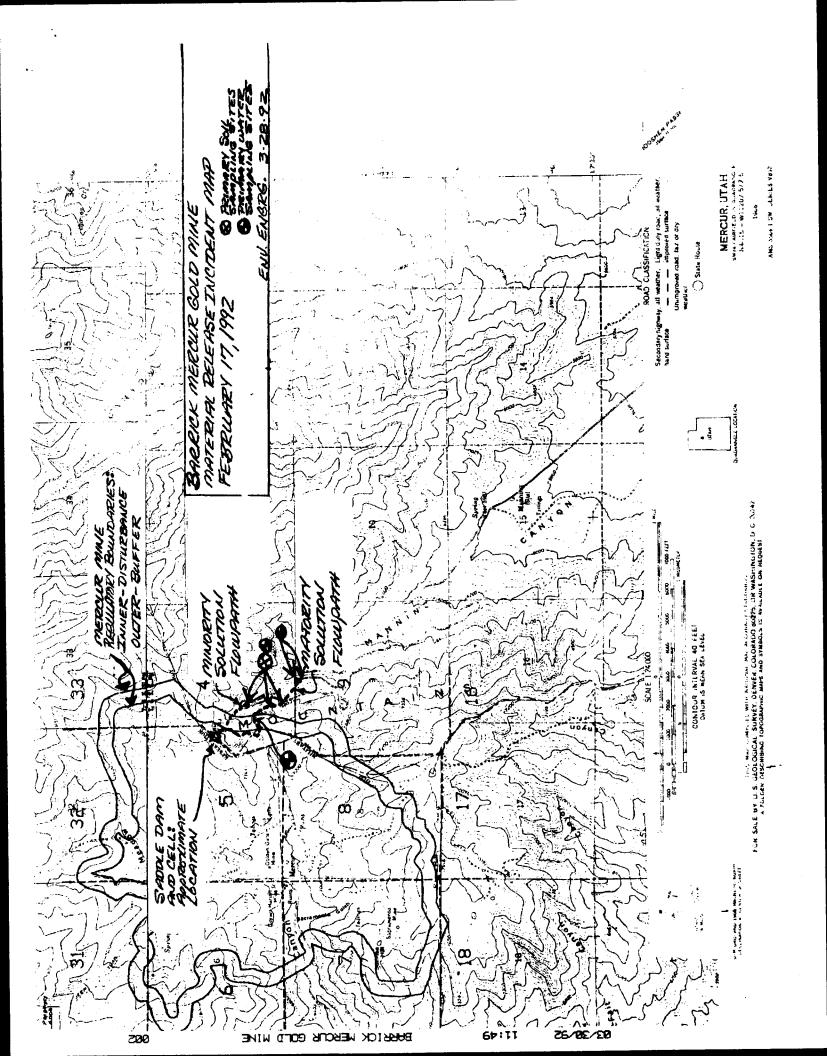
Alkalinity as CaCO3, mg/l Aluminum as Al (T), mg/l Aluminum as Al (D), mg/l Ammonia as NH₃-N, mg/l Arsenic as As (T), mg/l Arsenic as As (D), mg/l Barium as Ba (T), mg/l Barium as Ba (D), mg/l Bicarbonate as HCO; mg/1 Boron as B (T), mg/l Cadmium as Cd (T), mg/) Cadmium as Gd (D), mg/l Calcium as Ca, mg/l Carbonate as CO1, mg/1 Chloride as Cl. mg/1 Chromium as Cr (Hex), mg/l Chromium as Cr (T), mg/l Chromium as Cr (D), mg/1 Conductivity, uhmos/cm Copper as Cu (T), mg/l Copper as Cu (D), mg/)

PARAMETER

Cyanide as CN (T), mg/1 WAD Cyanide as CN, mg/l Cyanide as CN (Free), mg/1 Fluoride as F, mg/l Gold as Au (T), mg/l Gold as Au (D), mg/l Hardness as CaCO1, mg/1 Hardness (Non-Carb) as CaCO3, mg/l Hardness (T) as CaCO3, mg/1 Hydroxide as OH, mg/l Iron as Fe (T), mg/l Iron as Fe (D), mg/l Lead as Pb (T), mg/l Lead as Pb (D), mg/l Magnesium as Mg (T), mg/1Magnesium as Mg (D), mg/l Manganese as Mn (T), mg/lManganese as Mn (D), mg/l Mercury as Hg (T), mg/1 Mercury as Hg (D), mg/l Nickel as Ni (T), mg/l Nickel as Ni (D), mg/l

PARAMETER

Nitrate as NO₃-N, mg/l Nitrite as NO₂ N, mg/1 Phosphate as PO₄-P (T), mg/1 Potassium as K, mg/l Selenium as Sc (T), mg/l Selenium as Se (D), mg/1Silica as SiO2 (D), mg/1 Silver as Ag (T), mg/1Silver as Ag (D), mg/l Sodium as Na, mg/l Sulfate as SO4, mg/l Suspended Solids, mg/1 Thallium as T1 (T), mg/1 Thallium as Tl (D), mg/l Total Dissolved Solids, mg/l Turbidity, NTU Zinc as Zn (T), mg/l Zinc as Zn (D), mg/l pH Units Cations, meq/l Anions, meg/l





127 SOUTH 500 EAST, SUITE 300, SALT LAKE CITY, UTAH 84102-1959 (801) 521-9255 FAX: (801) 521-0380

March 27, 1992

Barrick Resources (USA), Inc. Mercur Gold Mine P.O. Box 838 Tooele, Utah 84074

Attention: Mr. Glenn Eurick

Gentlemen:

Re: Assessment of Tailings Reclaim Spill Impacts on Monitor Wells MW-5, MW-7, MW-8, and MW-9

Mercur Gold Mine, Utah

On February 17, 1992, Barrick reported a release from the tailings reclaim pond with an estimated volume of 308,700 gallons of dilute sodium cyanide solution at the Mercur Gold Mine. Don Ostler, Executive Secretary of the Utah Water Quality Board requested written documentation on several items, one of which was an assessment of whether or not the water quality in compliance monitoring wells at either the Tailings Impoundment or Dump Leach Area #2 would be impacted by the spill. The following report summarizes information on well locations and completions, and provides a synopsis on the hydrogeology for the area. Based on this information, we present our opinion on potential impacts of the spill on monitor wells MW-5, MW-7, MW-8, and MW-9.

BACKGROUND INFORMATION

Barrick submitted a Material Release report to regulatory officials, including the Utah Department of Environmental Quality, with the following information:

- The release site was the inactive reclaim water cell located on the southeast side of the tailings impoundment and upstream of the Saddle Dam.
- The estimated volume of the release is 308,700 gallons containing total cyanide concentrations of approximately 10 to 15 ppm.

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- The cause of the release was the inadvertent siphoning of dilute sodium cyanide solution from an inactive component cell within the tailings impoundment. Substantial amounts of precipitation caused the solution level to rise in the cell. An open, inactive piping system was overtopped, creating a siphon which resulted in the discharge from the cell.
- The solution syphoned to a valve sump at the toe of the saddle dam, over-topped the sump and flowed downhill on the ground surface. Plate 1 shows the direction of movement of the release. A minor amount of the solution (20 percent) drained to the Saddle Dam Seepage catchment pond. This minor amount of flow eventually overtopped the lined collection pond, washed away a portion of embankment, and released to a natural drainage in Manning Canyon. The major amount of flow (80 percent) traveled along an earthen roadway mixing with road sediment and snow pack. Part of this flow followed the east side of the road and flowed into a natural drainage in Manning Canyon. An estimated 20,000 gallons temporarily ponded between the west side of the road and the berm for Dump Leach Area #2, creating standing water about 2 ft deep. Within 48 hours all but 6-inches of the standing water drained through the 10-inch culvert under the roadway and flowed toward the mud pit on the east side of the road. The mud pit overflowed and the release followed a natural drainage in Manning Canyon.
- Barrick sampled the water ponded on the west side of the road and found that total cyanide had been reduced to approximately 1 part per million.

Four monitor wells are located near the path of the release, including MW-5, MW-7, MW-8 and MW-9. The release came within approximately 30 feet (ft) of MW-7 and 140 ft of MW-5. The release was about 75 ft southwest of MW-8 and 350 ft northeast of MW-9. The geologic and hydrologic setting for the area and information on the wells are discussed below.

HYDROGEOLOGY NEAR MONITOR WELLS

Water-bearing formations in the vicinity of the tailings facility and Dump Leach Area #2 include unconsolidated deposits, the Manning Canyon Formation, and the Great Blue Limestone.

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The unconsolidated alluvial and colluvial deposits are thin, generally fine-grained, and tend to perch water over less permeable limestones and shales. Perched aquifers are localized in extent. The unconsolidated deposits range in depth from about 24 to 64 feet, and are comprised predominantly of silts and clays, with lesser amounts of silty gravels. The alluvium was unsaturated at well locations MW-4, MW-6, and MW-8, which are situated below the saddle dam. (Wells MW-4 and MW-6 were abandoned.) Perched water was encountered in wells MW-5 and MW-7. Permeabilities calculated from testing these wells ranged from 107 to 230 feet per year (ft/yr) or 1.03 x 10⁻⁴ to 2.22 x 10⁻⁴ centimeters per second (cm/sec).

Flow in the bedrock aquifer is primarily through joints and fractures. Well MW-8 intersected bedrock of the Manning Canyon Formation, which is comprised mostly of limestones and shales. The Manning Canyon Formation has an estimated stratigraphic thickness of approximately 1300 feet in Manning Canyon. The Medial Limestone is a thin limestone-shale-quartzite sequence within the formation. Measurements of bedding near MW-8 show orientations of N15°W to N25°W with beds dipping from 43 to 68 degrees to the northeast. The dominant joint system trends easterly. Permeability calculated from testing MW-8 was 39 ft/yr or 3.79 x 10⁻⁵ cm/sec.

Well MW-9 was drilled into the upper member of the Great Blue Limestone. The formation consisted of alternating beds of dark gray fine-grained limestone interbedded with silty limestone, shaley limestone, and lesser amounts of shales and argillaceous shales and limestones. Bedding strikes approximately N25°W and dips to the east in excess of 50 degrees. The base of the upper member of the Great Blue Limestone may range between 900 to 1,500 feet below Area #2. Permeability calculated from testing MW-9 was 26 ft/yr or 2.51 x 10⁻⁵ cm/sec.



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Structurally, Dump Leach Area #2 and the western edge of the tailings pond lie on the allochthanous upper plate of the Manning Thrust, which has been thrust eastward possibly on the order of several thousand feet. The thrust, exposed on the eastern edge of Area #2, dips steeply to the west below the facility. The trend of the erosional exposure of the Manning Thrust parallels the strike of bedding or is oriented about N25°W.

GROUND WATER LEVELS AND FLOW DIRECTIONS

Alluvial wells MW-5 and MW-7 both intersected perched water. Wells were screened from about 46 to 66 feet below land surface (Plate 2). On January 9, 1992, water elevations in these wells were measured at 7,019 and 7,020 ft above sea level, respectively. Flow is predicted to travel easterly to southeasterly in response to the canyon topography. These shallow ground water elevations are approximately 30 feet above the elevation of the operating fluid head in Dump Leach Area #2.

Wells MW-8 and MW-9 intersected ground water in the fractured bedrock aquifer. Plate 2 shows well completions and the logs of borings. Ground water flow in the bedrock aquifer is estimated to be in an easterly to north-easterly direction.

MW-8 was screened from 247 to 300 feet below surface (elevations of 6,970 and 6,917 ft above mean sea level). Ground water was first encountered at 286 ft below surface or at an elevation of about 6,931 ft. A water elevation was measured at 6,940 ft on March 3, 1992.

Well MW-9 was screened from 1,131 to 1,205 ft below ground surface (elevations 5,939 and 5,865 ft above mean sea level). Ground water was first encountered at the 1,175 foot depth during drilling (an elevation of 5,895 ft). A ground water elevation was measured at 6,132 ft on March 2, 1992. Therefore,



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ground water levels were 237 ft higher than the depths where the first zones of saturation were noted while drilling, suggesting that confining conditions exist.

IMPACTS OF RELEASE

Four monitor wells are located near the pathway of the release, including MW-5, MW-7, MW-8, and MW-9. The potential impacts of the release on monitor wells in the area are influenced by the following:

- In general, the release traveled quickly on the ground surface, flowing downhill in response to topography. In the areas of primary surface flow only minor infiltration is expected to have occurred.
- In areas with ponding, significant dilution has occurred with the addition of runoff from melted snow. Barrick collected a sample from the ponded solution and found less than one part per million of free cyanide.
- Natural photo-degradation of free cyanide occurred on contact with the atmosphere. Dilution also occurred as the release mixed with runoff from melted snow. Continued degradation of the weak cyanide solution is expected to occur as infiltration travels vertically.

Shallow monitor wells MW-5 and MW-7 were the closest downgradient wells to the path of the release. The potential for impacts in these two wells is considered to be low near the surface runoff of the release and moderate near the ponded solution in the vicinity of Dump Leach Area #2. A low potential is predicted for impacts from surface runoff because of the rapid transport and minor infiltration of the solution as it migrated toward the natural drainages. A larger potential for impact is predicted from the infiltration of the ponded release near Dump Leach Area #2. Dilution of the cyanide solution by snow melt runoff occurred at the same time the ponding took place as documented by samples collected by Barrick from the ponded solution. The solution must migrate vertically about 45

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ft to enter the top of the screened intervals in Wells MW-5 and MW-7. The probability exists that some natural degradation and dilution will occur during vertical migration that will further reduce cyanide concentrations.

Wells MW-8 and MW-9 were 75 to 350 ft away from the release as measured on the ground surface. Depending on the flow direction specific to these areas, MW-8 and MW-9 could be laterally away from or upgradient from the release. The even greater vertical distances that the release would travel before reaching the well screens (247 and 1,131 ft to the top of the screened intervals) makes it unlikely that measurable quantities will be present.

If you have any questions or comments on the conclusions from this evaluation please do not hesitate to call.

Sincerely,

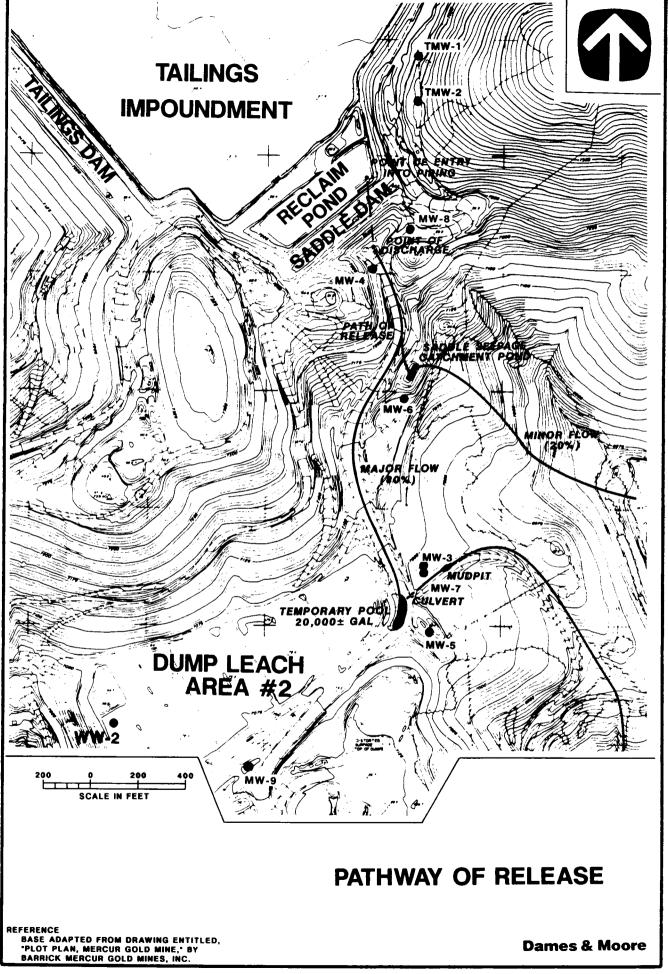
Dames & Moore

Lori C. Robison

Project Hydrogeologist

Attachments:

Plate 1 - Pathway of Release Plates 2A and 2B - Log of Borings



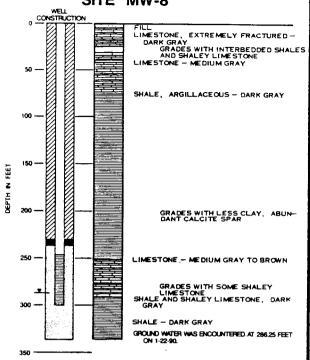
SITE MW-5



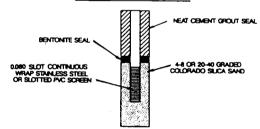
SITE MW-7



SITE MW-8



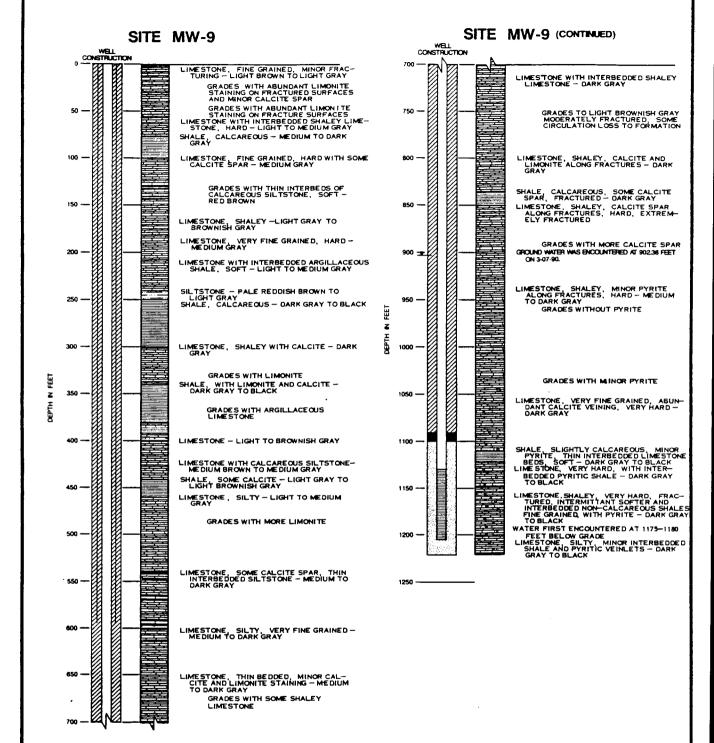
KEY TO WELL CONSTRUCTION





LOG OF BORINGS

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LOG OF BORINGS

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